

Claims

1. A permanent magnet direct current motor comprising:
a permanent magnet stator including at least one permanent magnet;
5 a rotor including a rotor shaft, an armature core mounted on the shaft and having a plurality of poles, an armature winding wound about the poles, and a commutator mounted on the shaft adjacent one end of the armature core and connected to lead wires of the armature winding, the rotor being journaled in bearings and located confronting the stator; and
10 a speed sensor;
wherein the speed sensor is a coil of conductive material fixed to the surface of the magnet and located in the air gap between the magnet and the armature core.
2. The motor of Claim 1, wherein the conductive material is a thin deposit of
15 conductive ink, especially a conductive epoxy.
3. The motor of Claim 1, wherein the coil extends axially for substantially the axial length of the magnet.
- 20 4. The motor of Claim 1, wherein the coil is a single turn coil.
5. The motor of Claim 4, wherein the coil is a single turn coil in the form of a long narrow "U" extending substantially in the axial direction of the motor.
- 25 6. The motor of Claim 5, wherein the coil extends axially at substantially the same angle as the poles of the armature core.
7. The motor of Claim 5, wherein the coil has a lateral gap between the arms of the "U" substantially equal to the circumferential gap between the poles of the
30 armature core.
8. The motor of Claim 1, wherein the speed sensor further comprises a second single turn coil connected across the terminals of the first coil and located adjacent thereto but circumferentially spaced therefrom.
- 35 9. The motor of claim 8 wherein the two coils are connected in series and are separated circumferentially by a distance equivalent to a whole number multiple of the distance between the poles of the armature core.

10. The motor of claim 8, wherein the first and second coils are substantially U-shaped and have a common leg forming a long narrow W-shaped pattern.

5 11. The motor of Claim 1, wherein coil terminals of the speed sensor are located on an axial end surface of the magnet.

10 12. The motor of Claim 11, wherein the motor has a deep drawn cup like housing with an open end closed by an end cap and the coil terminals electrically engage with spring biased terminals fixed to the end cap

13. The motor of Claim 12, wherein the spring biased terminals are resiliently deformable fingers extending from the motor end cap.

15 14. The motor of Claim 2, wherein the conductive ink is a silver epoxy.